#4

DESCRIPTION AND OPERATING INSTRUCTIONS

RS-6

RS-6

Section I. Description and Data

Radio Station RS-6 is a compact four-unit set for transmitting cw and receiving cw or voice. It operates from ac, storage battery, or hand generator, and consists of Transmitter RT-6, Receiver RR-6, Power Supply RP-6, and Filter Accessory Unit RA-6. The four units weigh approximately $15\frac{1}{2}$ pounds and are packed in waterproof plastic bags as shown in Figure 1.

A. Transmitter RT-6 (See Figure 2)

1. Frequency Range (two bands)

a. 3 to 7 mc

b. 7 to 16.5 mc

2. Power Input

a. 400 volts dc at 75 ma

b. 6.3 volts ac-dc at 1.2 amps

B. Receiver RR-6 (See Figure 3)

1. Frequency Range (two bands)

a. 3 to 6.5 mc

b. 6.5 to 15 mc

2. Power Input

a. 90 volts dc at 50 ma

b. 6.3 volts ac-dc at 1.2 amps

C. Power Supply RP-6 (See Figure 4)

1. Power Source: ac line or 6 volt storage battery

2. Power Input

a. a-c 70 to 270 volts at 40 to 400 cps

b. d-c 6.3 volts at 12 amps

3. Power Output

a. 400 volts at 75 ma

b. 90 volts dc at 25 ma

c. 6.3 volts dc at 2.4 amps

4. Fuses

a. a-c 1.5 amps

b. d-c 15 amps

D. Filter-Accessory Unit RA-6 (See Figures 5 and 6)

Accessories:

1 Earset and cord
1 AC cable assembly
1 Battery cable assembly
1 Spare fuse - 1.5 amp
1 Spare fuse - 15 amp
1 Set Schematic Diagram and Parts List
2 Protective sockets for rectangular AC and BAT plugs

E. Additional Accessories (See Figure 7)

The following accessories are contained in a plastic pouch:

1 Twisted double-wire cable
1 Roll antenna wire
1 Spare lamp for ANT ADJ MAX Indicator
2 Antenna Insulators
2 Battery clamps

Section I. Setting Up Equipment

A. Transmitter and Receiver Connections

The transmitter and receiver connections to the filter accessory unit are identical for a-c, battery, or hand generator operation. These connections are shown in Figures 8, 9, and 10; or on Pages 1 and 2 of the Schematic Diagram and Parts List attached to the cover of Filter-Accessory Unit RA-6. A description of these connections follows:

1. Only one antenna is required for both transmitting and receiving. The antenna is inserted into the terminal on the top of the transmitter marked ANT. A ground wire, leading to a water pipe, gas pipe, buried iron stake, or counterpoise, is connected to the terminal marked GND on the transmitter next to the ANT terminal. (If receiving only is desired, these connections may be made instead to the corresponding terminals on the receiver, marked ANT and GND).

2. Remove the power plug from its recess on the transmitter and insert it into the plug receptacle on the Filter-Accessory Unit RA-6 marked TRANS, making certain that the white mark on the Transmitter Power plug lines up with the white mark next to the TRANS receptacle on the housing of the Filter-Accessory Unit.

3. Remove the receiver power plug from its recess in the end of the receiver. Insert this plug into the plug receptacle on the Filter-Accessory Unit RA-6 marked RECVR, making certain that the white mark on the Receiver Power plug lines up with the white mark above the RECVR power plug receptacle on the housing of the Filter-Accessory Unit.

4. Remove power plug from its recess, marked POWER PLUG, in Power Supply RP-6 and insert it in the power supply receptacle, marked POWER SUPPLY, of Filter Accessory Unit RA-6, lining up the mark on this plug with the white mark by the power plug receptacle on the housing of the Filter-Accessory Unit.

5. Insert the ear phone metal tips into the terminals on the receiver marked PHONES.

6. A short length of twisted pair cable is provided in the plastic accessory pouch. One wire of this cable has a metal tip on each end. The other wire has a metal tip on one end and a spring clip on the other. Taking the end of the cable that has the metal tips on both wires, insert one tip of the wire that has metal tips on both ends into the terminal on the transmitter marked REC ANT and the other tip into the terminal on the receiver marked ANT. Next insert the metal tip of the other wire into the terminal on the transmitter marked MONITOR and fasten the spring clip on the opposite end of this wire to the metal tip of the ear plug lead that is inserted into the top PHONE terminal. (Make certain this clip does not touch against the receiver case as this will short out the monitoring signal). This feature allows the operator to hear his own signal as he is sending.

7. This completes the receiver-transmitter connections. The power supply connections for a-c, battery, or hand generator operation are discussed below.

8. Pull sending key out of recess marked KEY on transmitter RT-6.

B. Power Supply Connections

1. A.C. Operation (Figure 8)

a. Rotate the input voltage selector dial switch on Power Supply RP-6 to OFF. (This switch, the only one on Power Supply RP-6, is the dial switch marked OFF, 270, 230, etc. to 70). This switch is used to match the local a-c voltage to Power Supply RP-6 for proper operation of the set.

b. Connect equipment as follows:

(NOTE: Connections must be made in the sequence below or equipment may be damaged or a fuse blown)

(1) Remove protective socket from the rectangular plug marked AC. Insert this rectangular plug into the OPERATE receptacle on Power Supply RP-6.

(2) Connect the two-prong plug of the a-c cable assembly to any a-c power source whose voltage is between 70 to 270 volts, and frequency between 40 to 400 cycles. The two-prong a-c power plug can be adapted to various receptacles by:

(a) Expanding or squeezing the rubber plug to vary the spacing between the prongs.

(b) Unscrewing and reversing prongs.

c. Slowly rotate the input voltage selector dial switch on Power Supply RP-6 clockwise to first position at which the neon indicating light glows. Power Supply RP-6 is now matched to the local a-c voltage. Do not turn switch beyond this point! Doing so may burn out a fuse. The transmitter and receiver are now ready for operation.

d. Turn off equipment by pulling power plug from power source or by turning input voltage selector dial switch to OFF position. Do not turn off the equipment by disconnecting rectangular plug marked AC from the OPERATE receptacle on Power Supply RP-6 as this exposes terminals that have voltage on them.

2. Battery Operation (Figure 9) As stated in Para A above the transmitter and receiver connection to the filter accessory unit are the same for A.C., battery and hand generator operation. Instructions for using battery operation follow: (NOTE: Connections must be made in sequence below or equipment may be damaged or fuse blown.)

a. Set switch on Power Supply RP-6 to OFF.

b. Connect equipment as follows:

(1) Use only 6 volts of storage battery as a power source. If only higher voltage batteries are available, connect across 6 volts (3 cells) of battery.

(2) Remove protective socket from the rectangular plug marked BAT. Insert this rectangular plug in the OPERATE receptacle on Power Supply RP-6.

(3) Connect red battery lead to the plus (positive) 6 volt terminal of the battery, and the black battery lead to the minus (negative) 6 volt terminal of the battery.

c. The station is now ready for operation.

d. Turn off equipment by disconnecting clamp from either battery terminal. Do not turn equipment off by disconnecting rectangular plug marked BAT from the OPERATE receptacle on Power Supply RP-6 as this exposes "live" terminals.

3. Hand Generator Operation (Figure 10)

a. Assemble hand generator as shown in Figure 10. Either SSP-11 or GN 58 may be used. Power Supply RP-6 is not needed during hand generator operation.

b. Connect power cord from hand generator to plug marked POWER SUPPLY on Filter-Accessory Unit RA-6, setting up equipment as shown in Figure 10.

c. Required power is generated when the hand generator is cranked at 60 r.p.m.

4. Battery Charging Operation (Figure 11)

a. Only a 6-volt (3 cells) wet type storage battery can be charged.

(1) The normal charging rate is $3\frac{1}{2}$ amperes.

well ventilated place as dangerous gases are formed during charging process.

b. Connect equipment as follows: (NOTE: Steps must be followed in the sequence below or equipment may be damaged or fuse blown.)

(1) Turn the input voltage selector dial switch on Power Supply RP-6 to OFF.

(2) Remove protective socket from rectangular plug marked BAT. Insert this rectangular plug into receptacle marked BATT-CHARGE on Power Supply RP-6.

(3) Connect red battery lead to the plus (positive) 6-volt terminal of storage battery.

(4) Connect black battery lead to the minus (negative) 6-volt terminal of storage battery.

(5) Remove protective socket from rectangular plug marked AC. Insert this rectangular plug into receptacle marked OPERATE.

(6) Connect the two-prong plug of the AC cable assembly to any a-c power source whose voltage is between 70 to 270 volts, and whose frequency is between 40 to 400 cps. The two-prong a-c power plug can be adapted to various receptacles in the following ways:

(a) Expanding or squeezing the rubber plug to vary spacing between prongs.

(b) Unscrewing and reversing prongs.

(7) Slowly turn input voltage selector dial switch of Power Supply RP-6 clockwise to the first position at which the neon indicating light glows. Do not turn switch beyond the point where the neon indicating light glows, as a blown fuse may result. Battery is now being charged.

(8) To stop charging process, proceed as follows:

(a) Turn the input voltage selector dial switch on Power Supply RP-6 to OFF.

(b) Disconnect two-prong a-c plug from power source.

(c) Remove battery leads from battery.

Section II. Transmitter RT-6 (Figure 2)

A. Controls and Functions

1. CSC BANDSWITCH - Selects desired frequency band for oscillator.

a. Blue position - 3 to 7 mc

b. Red position - 7 to 16.5 mc

2. FINAL BANDSWITCH - Selects desired frequency band for final amplifier.

a. Blue position - 3 to 7 mc

b. Red position - 7 to 16.5 mc

3. CSCILLATOR TUNING DIAL - Tunes oscillator to desired frequency.

a. Blue scale - 3 to 7 mc

b. Red scale - 7 to 16.5 mc

4. FINAL AMPLIFIER TUNING DIAL - Tunes final amplifier to desired frequency.

a. Blue scale - 3 to 7 mc

b. Red scale - 7 to 16.5 mc

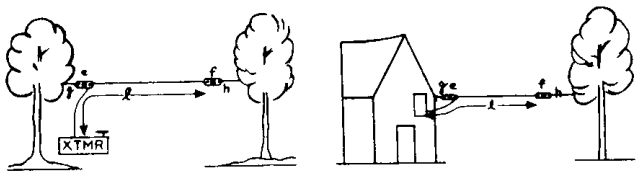
5. ANTENNA IMPEDANCE MATCHING DIAL SWITCH - Matches the antenna to the transmitter for maximum transmitter power output.

6. SENDING KEY - Used for hand keying the transmitter.

B. Antenna Length and Height

1. The most suitable antenna for this set is a single wire antenna, three quarter wave lengths long. If space is not available for a wire this long, then a shorter wire at least one quarter wave in length should be used. A good ground is important for the most efficient operation of either of these antennas.

2. The antenna length is measured as the length of wire between the end connected to the ANT terminal on the transmitter and the end connected to the furthest insulator. This is shown in Figure 12 as distance "1".



3. The following table may be used to determine approximate antenna length for any frequency within range of the RS-6:

Freq. in MC	Length in Meters		Length in Feet	
	$\frac{3}{4}$ Wave	$\frac{1}{4}$ Wave	$\frac{3}{4}$ Wave	$\frac{1}{4}$ Wave
3 to 5	75	25	234	78
5 to 7	45	15	141	47
7 to 9	30	10	100	33
9 to 11	25	8.5	78	26
11 to 13	20	--	64	--
13 to 15	17	--	54	--
15 and Over	15	--	47	--

4. Only one antenna is required for the RS-6 radio station, even though a number of frequencies over a wide frequency range are used. To select the proper length antenna from the table in the paragraph above, first determine the lowest frequency in the signal plan that will be used for transmitting. Note within which frequency range this frequency is included from those given in the first column in the table labled "Frequency in Megacycles (MC)". Determine the proper antenna length corresponding to this frequency range from the column labeled "Length in Meters." Both one quarter and three quarter wave length antennas are given, except for the frequencies 11 Mc and higher, above which frequencies the one quarter wave antenna is too short to be effective.

5. The above table is computed from the following formula for length of a one quarter wave length antenna:

$$L \text{ (Length in Meters)} = \frac{75}{\text{Frequency in Mc}}$$

This formula may be used if it is desired to compute exactly a one quarter wave length antenna at any frequency. The one quarter wave length value should be multiplied by 3 to find the length of a three quarter wave antenna.

6. The antenna should be as high as possible, consistent with need for concealment. Preferably, the antenna should be put outdoors and away from power lines, telephone wires, eave troughs, steel beams and other metal members. Figure 12 shows two typical outdoor installations. Since the portion of the antenna between each insulator and the tree or other support (g and h in Figure 12) has no electrical connection to the radiating portion between the insulators, rope, cord, twine, or any kind of available wire may be used to tie the insulators to the antenna supports. If a tree or trees are used as antenna supports make certain there is slack in the antenna to allow for tree sway.

7. Locate the antenna with one end close to the transmitter so as to keep the antenna lead-in as short as possible. This is to ensure that as much as possible of the antenna length "1" is in the air between the insulators where it will be most effective in radiating the transmitter signal.

8. Position the antenna so that it runs perpendicular to the direction of the receiving station, or, in other words, so that it is "broadside" to the receiving station.

9. If space limitations make it impossible to erect an antenna with most of the wire in

between the insulators may be used providing: 1) the over-all length of the antenna remains as figured from the table; 2) a good ground connection is made; 3) the antenna is kept well away from surrounding metal objects. It should be understood that a short antenna of this type is inefficient at the frequencies used on the RS-6. Therefore, it is important that the above rules be observed so as to get the most out of the antenna.

10. If no water or gas pipes are available for a ground connection, a 4 to 6 foot metal stake may be driven into the earth for a ground connection. A better ground is provided when the soil is moist. If a good ground cannot be made with any of the above methods, a counterpoise should be used. A counterpoise for this type antenna consists of a wire slightly longer than the antenna and placed on the ground directly beneath the antenna, security permitting.

11. If a horizontal antenna cannot be constructed, a vertical antenna may be erected, provided the length is the same as given in the table. The wire should be set as high above the ground as possible, and away from surrounding metal objects. A good ground is essential with this antenna.

12. If an outdoor antenna is not possible, an indoor antenna may be used. If the length of the antenna cannot be run in a straight line the wire should be run around two adjacent sides of a room or along the eaves in an attic, but away from metal objects such as eave troughs, pipes, etc.

13. Under unusual conditions communications may be carried on by connecting a short length of wire from the transmitter ANT terminal to a bed spring, window screen, or other metallic objects which are not grounded.

C. Tuning

1. Plug the desired crystal into the socket marked CRYSTAL.

switches to the desired operating frequency range. Both switches must be set to the same color.

a. Blue position covers frequencies from 3 to 7 mc

b. Red position covers frequencies from 7 to 16.5 mc

3. Set oscillator and final amplifier tuning dials as closely as possible to the desired operating frequency by means of the frequency calibrated dial markings. Both dials must be set the same.

a. The 3 to 7 mc markings are in blue

b. The 7 to 16.5 mc markings are in red

4. RECVR-TRANS switch on the Filter-Accessory Unit RA-6, located above RECVR power plug receptacle, should remain in the TRANS position as long as both transmitting and receiving are to be done. When receiving only is desired, the switch should be set to the RECVR position.

5. Turn antenna matching dial switch on Transmitter RT-6 to TUNE (zero) position. This disconnects the antenna and reduces radiation to a minimum while tuning up the transmitter.

6. Press sending key and rotate the oscillator tuning dial slightly in either direction until maximum brilliance of the OSC TUNE FOR MAX indicator bulb is obtained.

7. Press sending key and rotate the final amplifier tuning dial slightly in either direction until the FINAL TUNE FOR MAX indicator bulb shows maximum brilliance.

8. Press sending key down and turn antenna matching switch to position where ANT ADJ MAX indicator bulb glows brightest.

9. Press sending key and retune oscillator tuning dial slightly for maximum brilliance of the ANT ADJ MAX indicator bulb.

10. Press sending key down and retune final amplifier tuning dial slightly for maximum brilliance of ANT ADJ MAX indicator bulb. Release key. Transmitter is now ready for operation.

11. If difficulty is experienced in matching the antenna to the transmitter on any frequency as indicated by lack of a bright glow in the ANT ADJ MAX indicator, even though the transmitter has been properly tuned and the antenna loads properly on other frequencies, the antenna is probably too close to being a whole multiple of one half wavelength ($\frac{1}{2}$, one, $1\frac{1}{2}$, etc) to give an indication of current through the ANT ADJ MAX bulb. If this is the case, the antenna may be loading although the glow of the ANT ADJ MAX indicator may be too dim to notice easily. Cup a hand over the bulb to keep outside light from obscuring the glow and tune the antenna matching dial switch for maximum glow, no matter how faint.

D. Keying

The jack marked KEY JACK is designed for use of an external high speed keyer. This keyer will not be used in normal operation. An external hand key should not be used with this set.

Section III. Receiver RR-6 (Figure 3)

A. Controls and Functions

1. VOLUME DIAL - Controls volume of received signals.

2. RANGE SWITCH - Selects proper frequency band.

a. Blue position - 3 to 6.5 mc

b. Red position - 6.5 to 15 mc

3. TUNING DIAL - Quickly sets tuning dial to desired frequency.

4. VERNIER TUNING DIAL - A fine tuning control for the large tuning dial.

5. PRESS TO CALIBRATE BUTTON - Provides an audible tone at every 0.5 mc (500 Kc) point for purposes of checking accuracy of the dial calibration.

6. ADJUST CALIBRATION DIAL - Corrects errors in dial calibration by moving indicator hairline with respect to dial scale.

7. BFO DIAL - Turns beat frequency oscillator on and off and varies pitch of incoming cw signal.

B. Tuning the Receiver

1. Set RANGE switch for proper frequency band:

a. Blue range - 3 to 6.5 Mc.

b. Red range - 6.5 to 15 Mc.

2. Advance VOLUME INCREASE dial until rushing sound is heard.

3. Tune station with the TUNING (coarse) control or, for closer and more precise adjustment, use VERNIER TUNING DIAL.

4. The receiver should be calibrated each time the receiver is charged to a different frequency. The 500 Kc crystal oscillator in the receiver provides a calibration point at each megacycle and half-megacycle mark on the receiver tuning dial. (NOTE: divide kilocycles by 1000 to get megacycles; multiply megacycles by 1000 to get kilocycles). To calibrate tuning dial, proceed as follows:

a. Set RECVR-TRANS switch on Filter Accessory unit RA-6 to RECVR.

b. Disconnect wire from receiver ANT terminal.

c. Turn the BFO dial until zero is aligned with the white mark on the housing.

d. Tune receiver to the calibration check point closest to the desired frequency.

e. Hold down button marked PRESS TO CALIBRATE.

slightly in either direction until audible tone is heard. Tune this tone to zero beat. (NOTE: Zero beat is the no-sound point between the two sound peaks).

g. Turn ADJUST CALIBRATION DIAL moving the hairline until it coincides with the calibration point.

h. Tune receiver to desired frequency. This frequency is now accurately calibrated.

i. Re-connect wire to receiver ANT terminal.

5. When desired signal is heard, adjust VERNIER TUNING DIAL until zero beat of the signal occurs. From then on, tune with BFO dial, adjusting for best reception and tone.

6. If transmitting also is to be done, throw RECVR-TRANS switch on Filter-accessory unit RA-6 to TRANS position.

C. Tuning (Crystals)

To be used only when fixed frequency reception is required and crystals for this purpose are issued.

1. Plug specified crystal in CRYSTAL CONTROL socket.

2. Tune receiver at desired frequency until maximum reception is obtained.

3. Adjust BFO dial for best received signal.

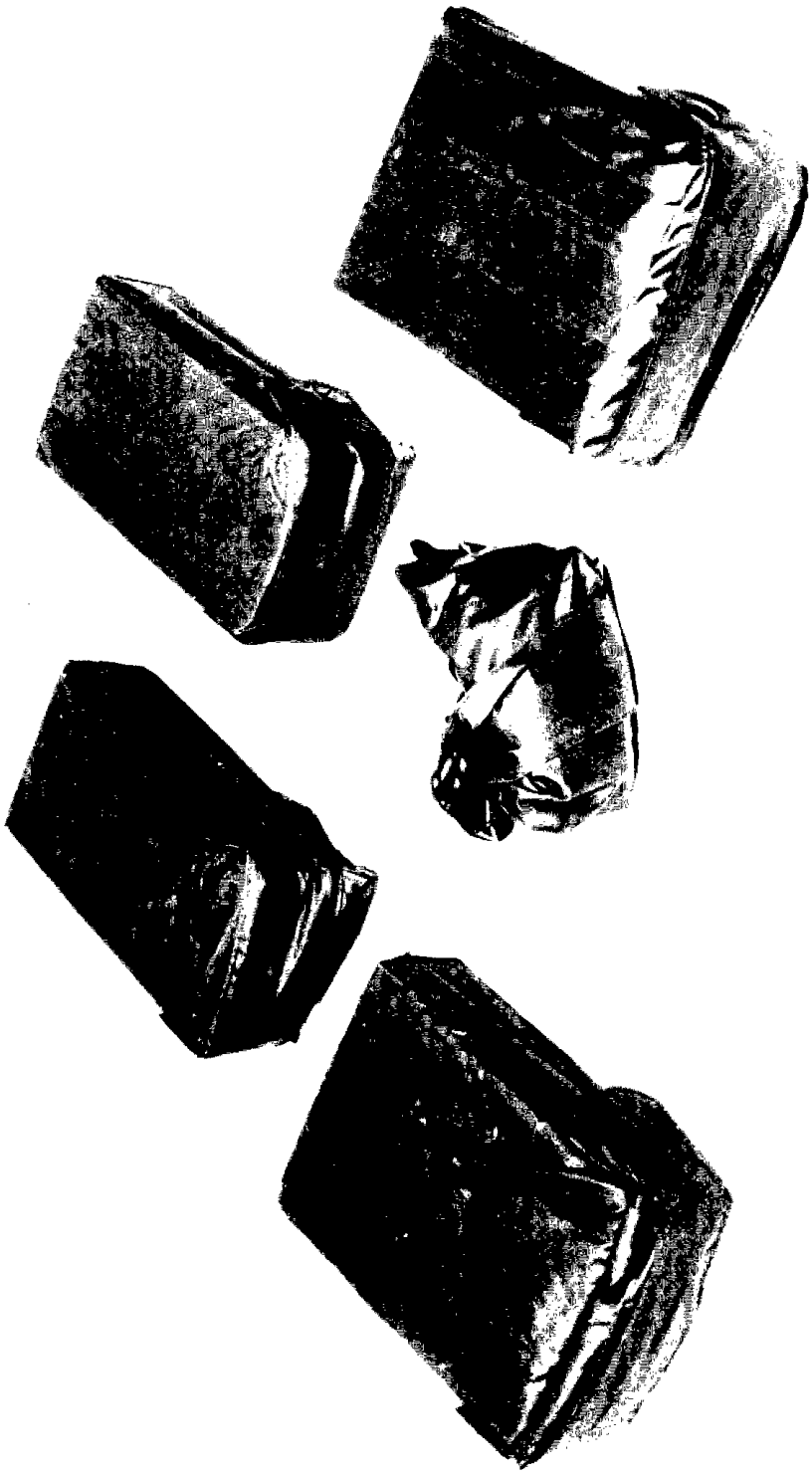
D. Log Scale

Signals may be accurately logged to three figures through use of the LOG SCALE.

1. After station is accurately tuned in, note the position of the white horizontal line on the dial scale with respect to the numerals 0, 1, and 2 located to the left of the dial scale opening. One of these numerals represent the first digit of the log scale.

2. Read and record the numeral located immediately above the white horizontal line on the window over the dial scale. Read the remaining two digits on LCG SCALE.

3. Once a station is logged in, the tuning dial may be re-set by these numbers for quick and easy location of that station when it is operating on the same frequency as previously logged.



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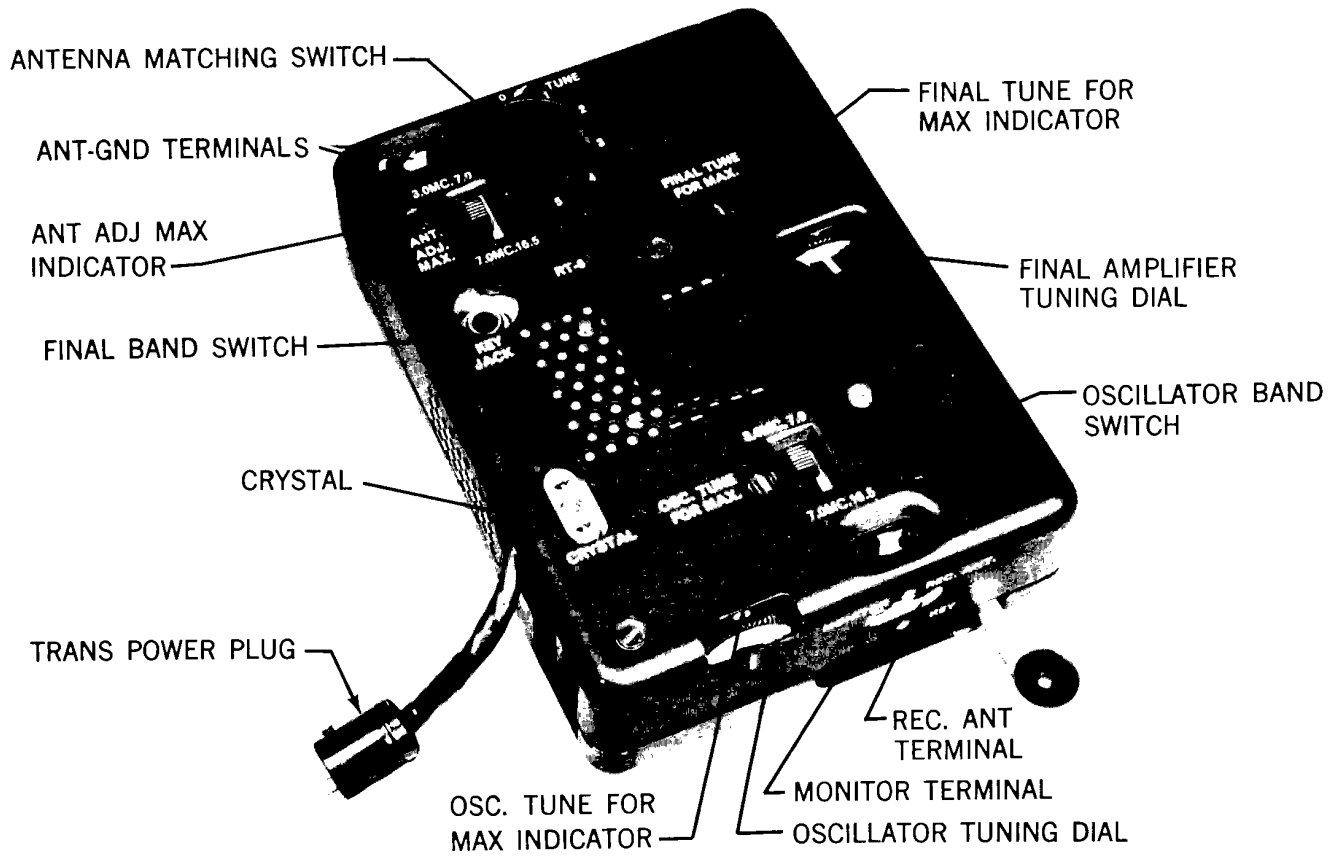


FIGURE 2

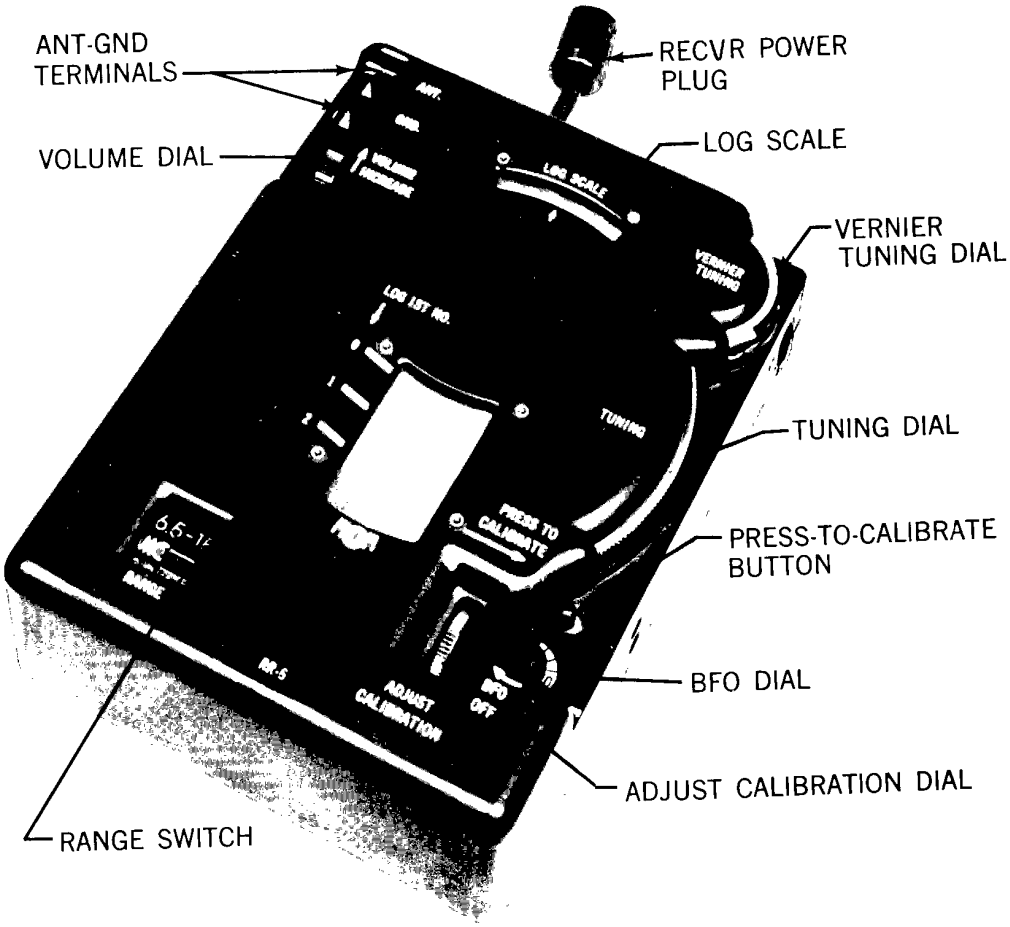


FIGURE 3

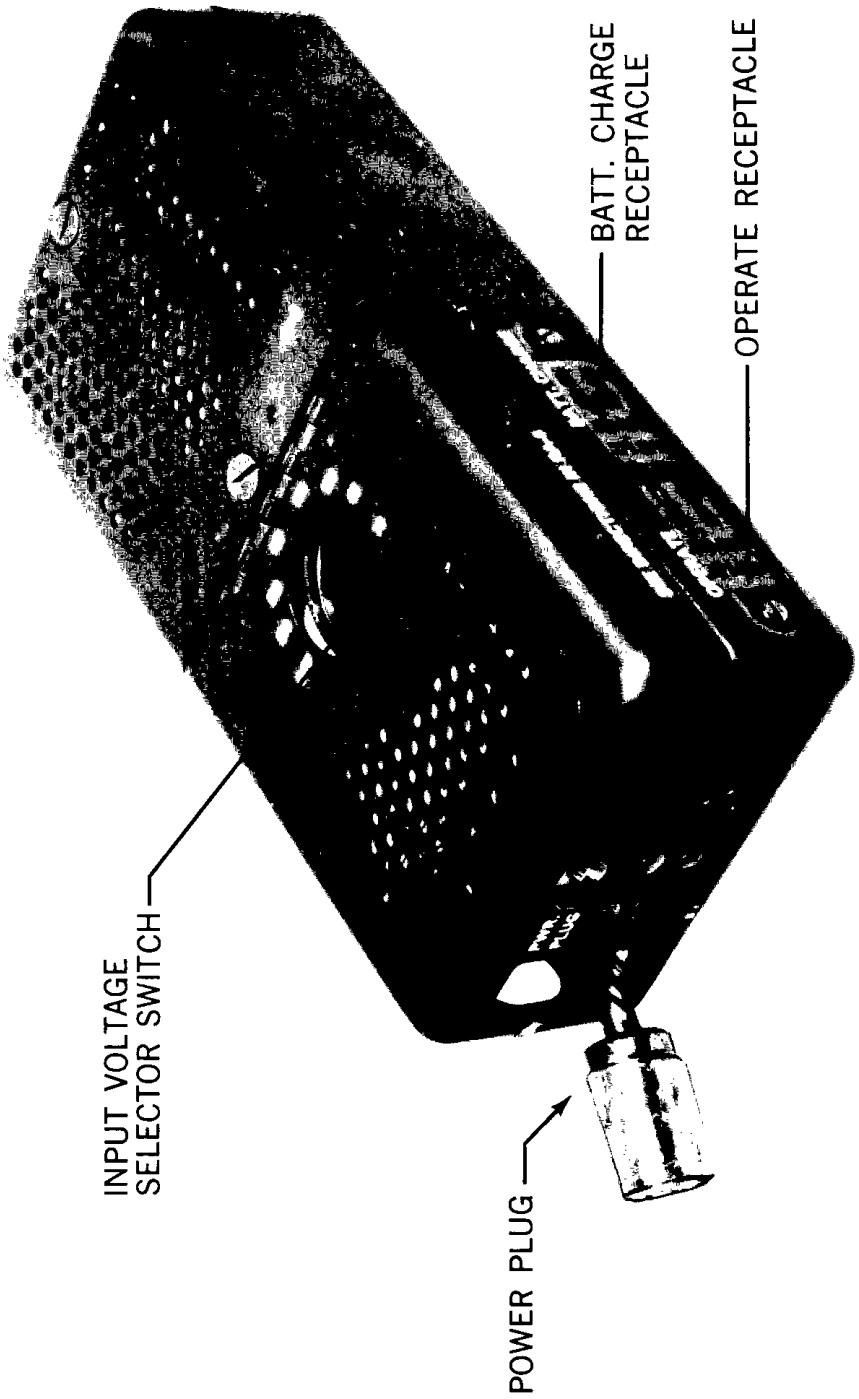


FIGURE 4

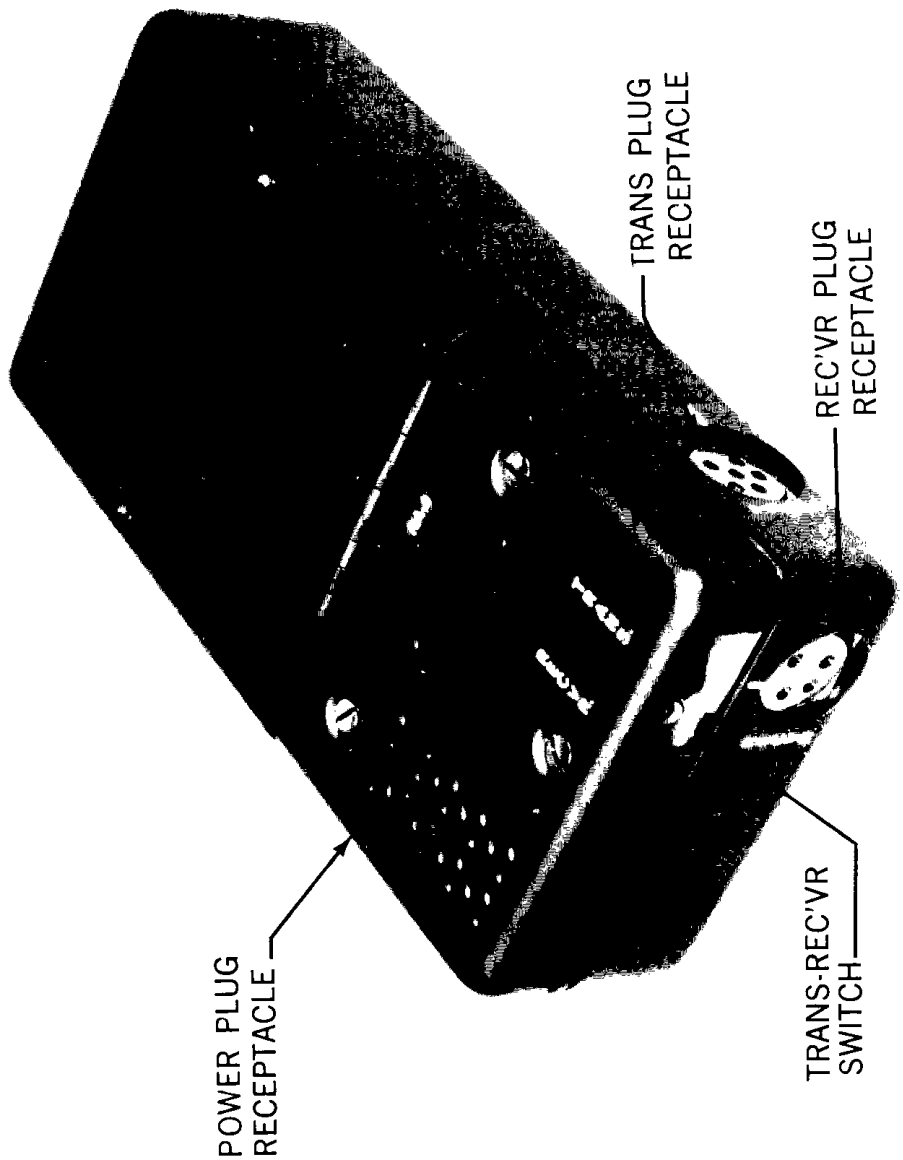
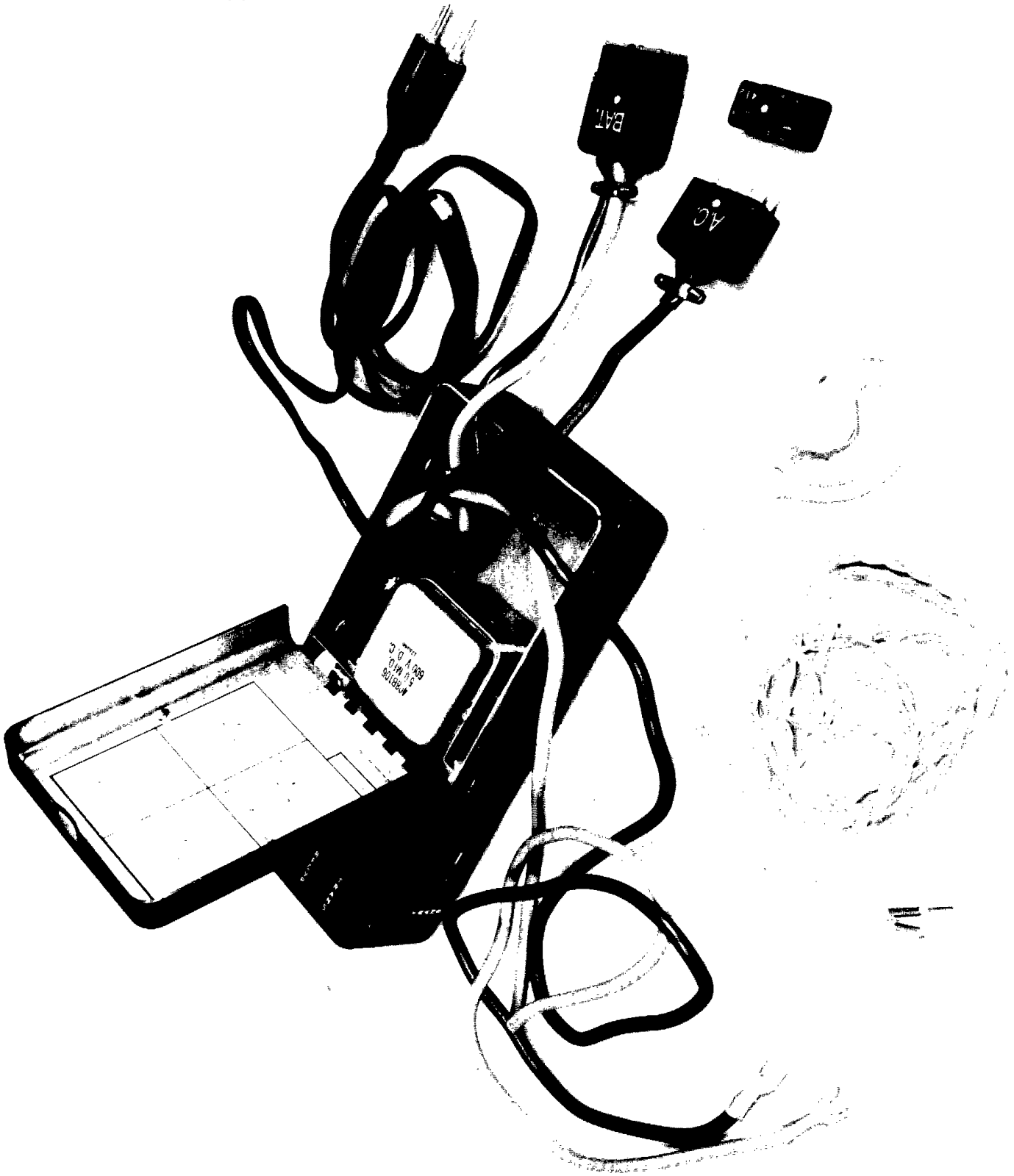


FIGURE 5



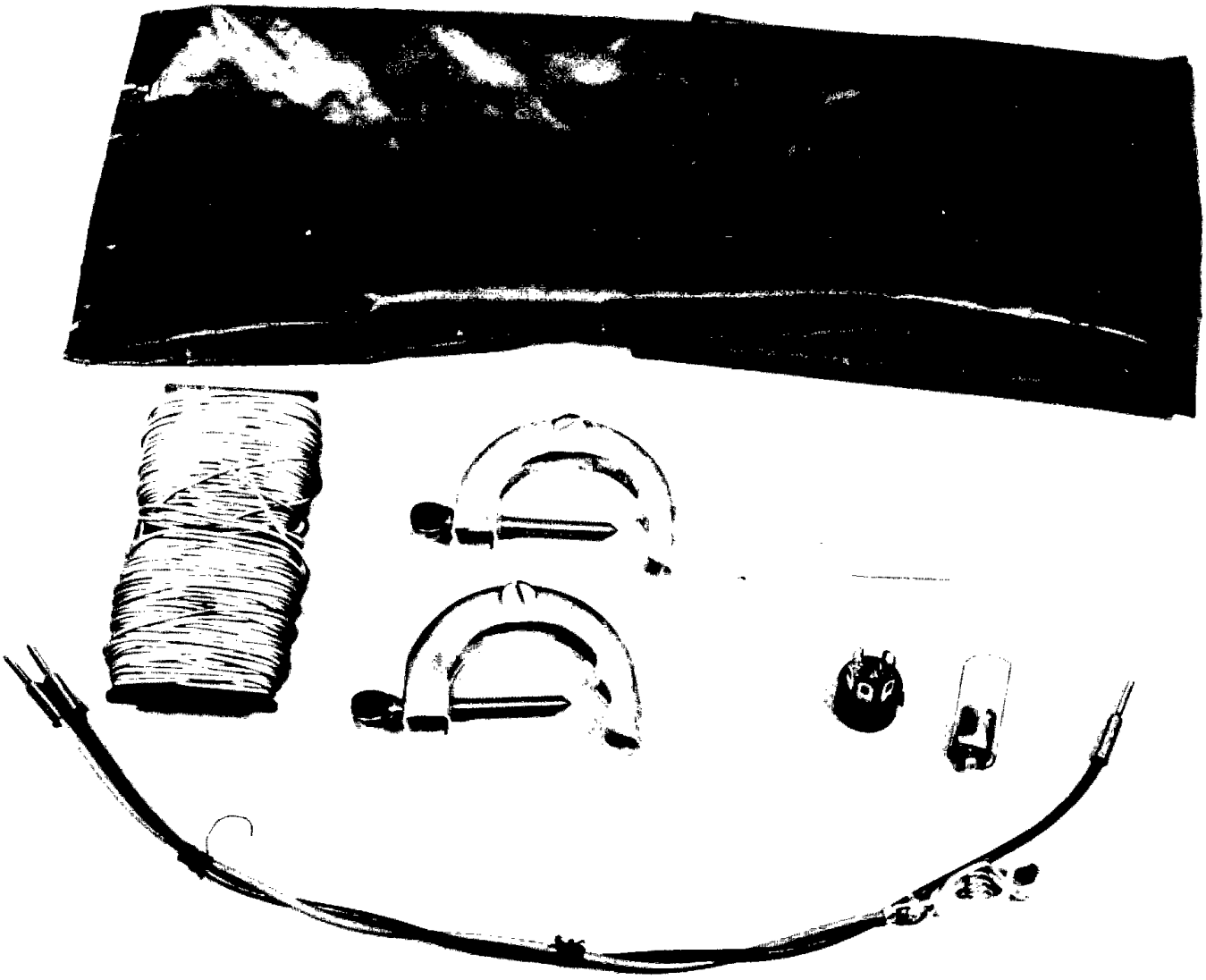


FIGURE 7

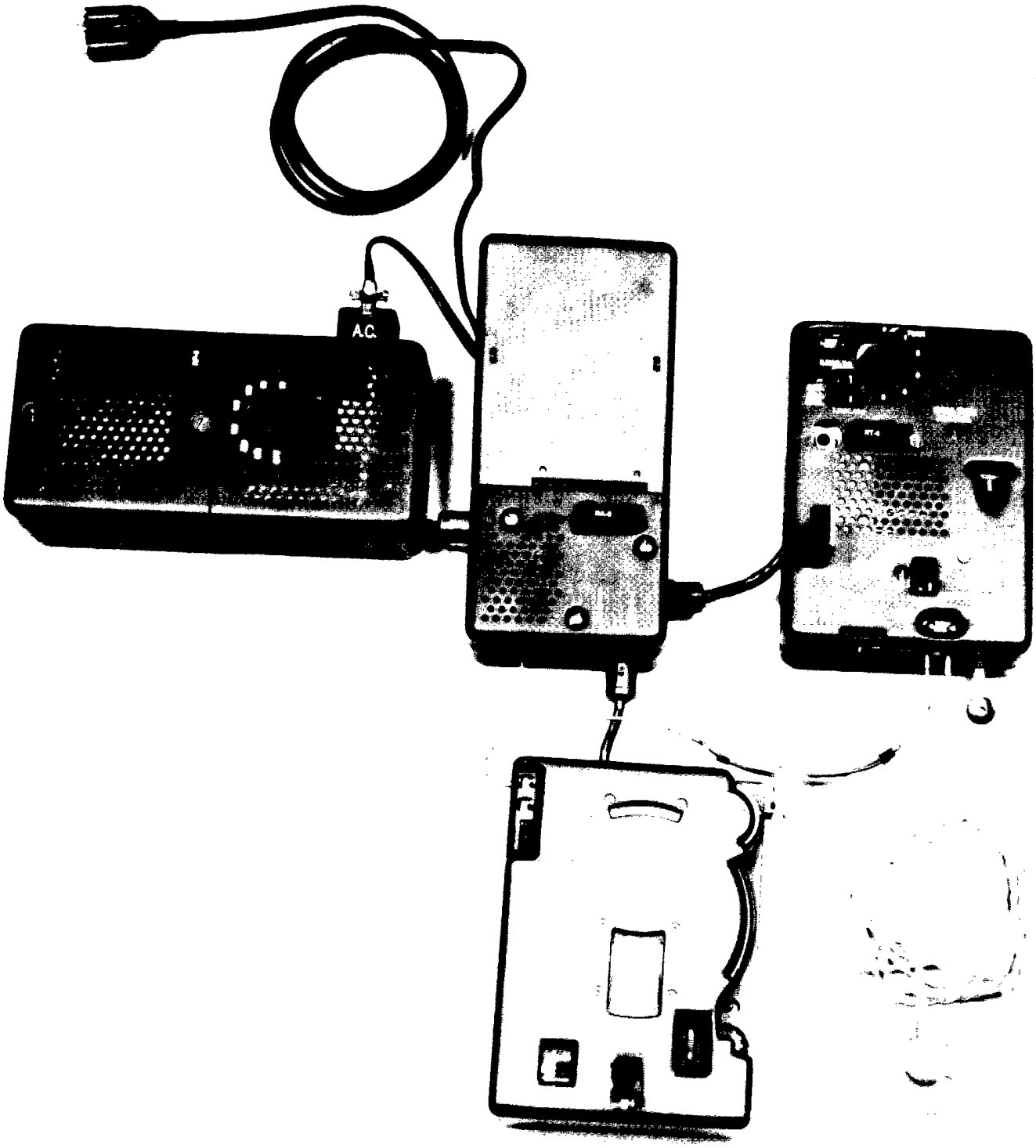
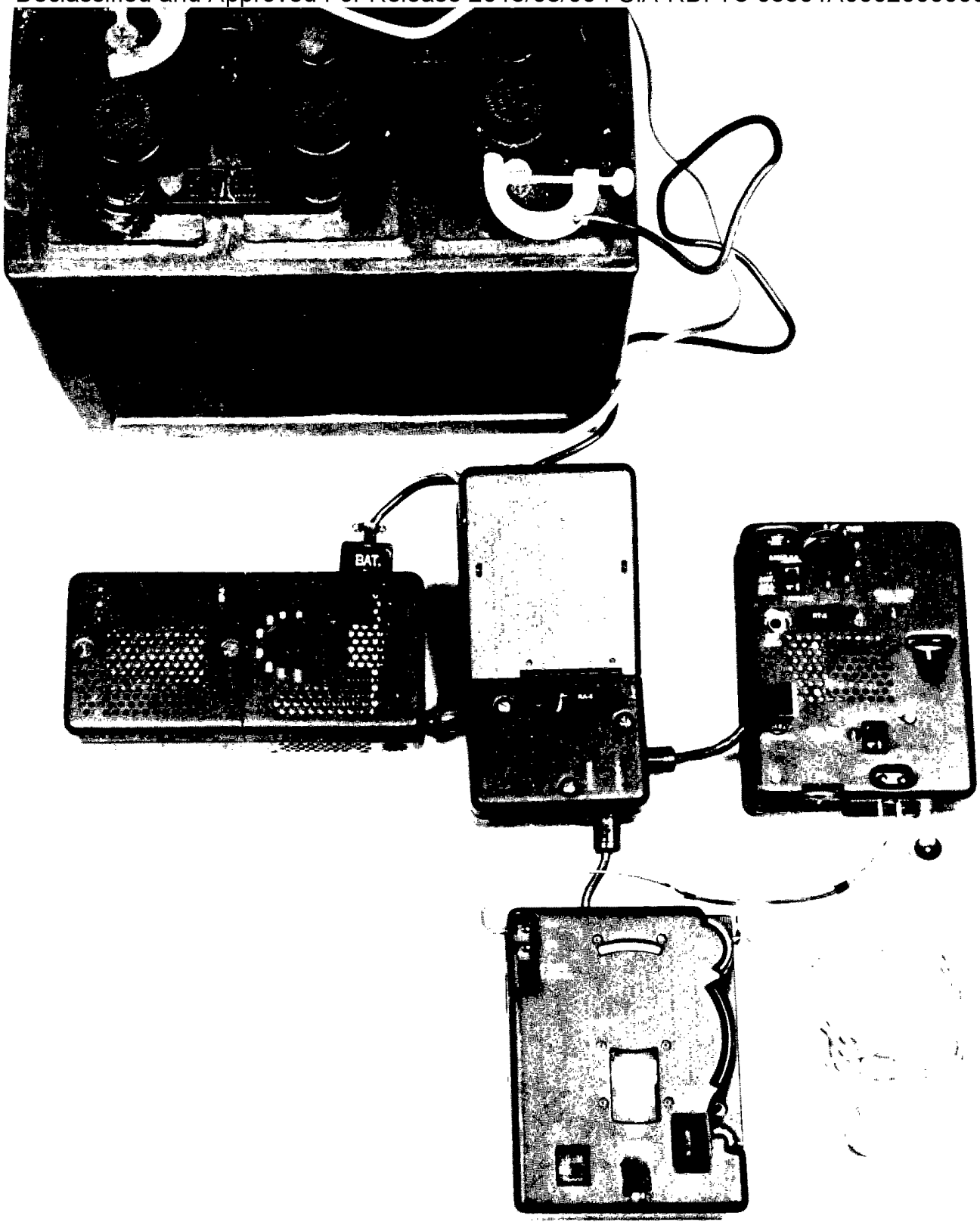


FIGURE 8



FIGURE

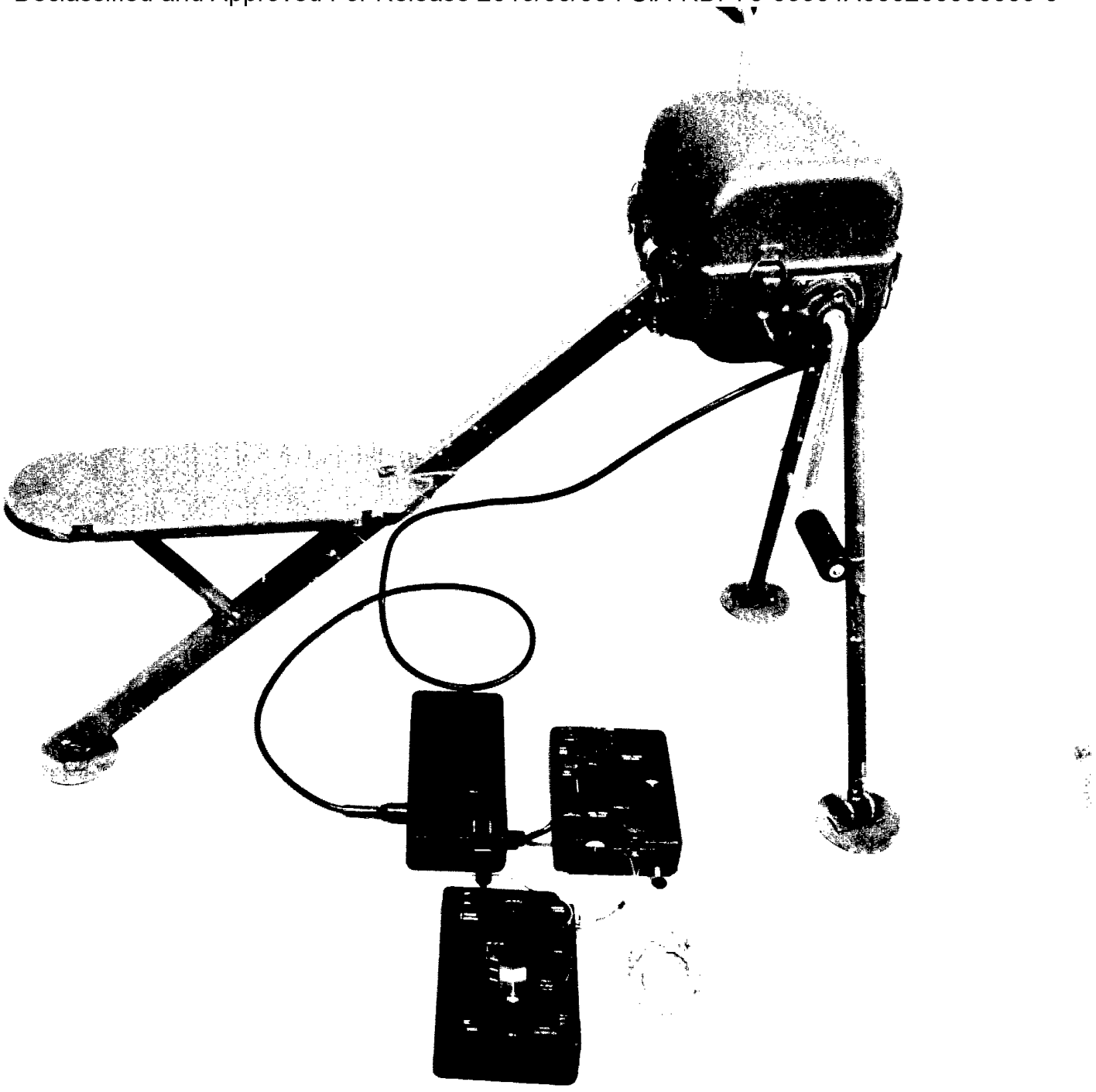


FIGURE 10